FIG. 1

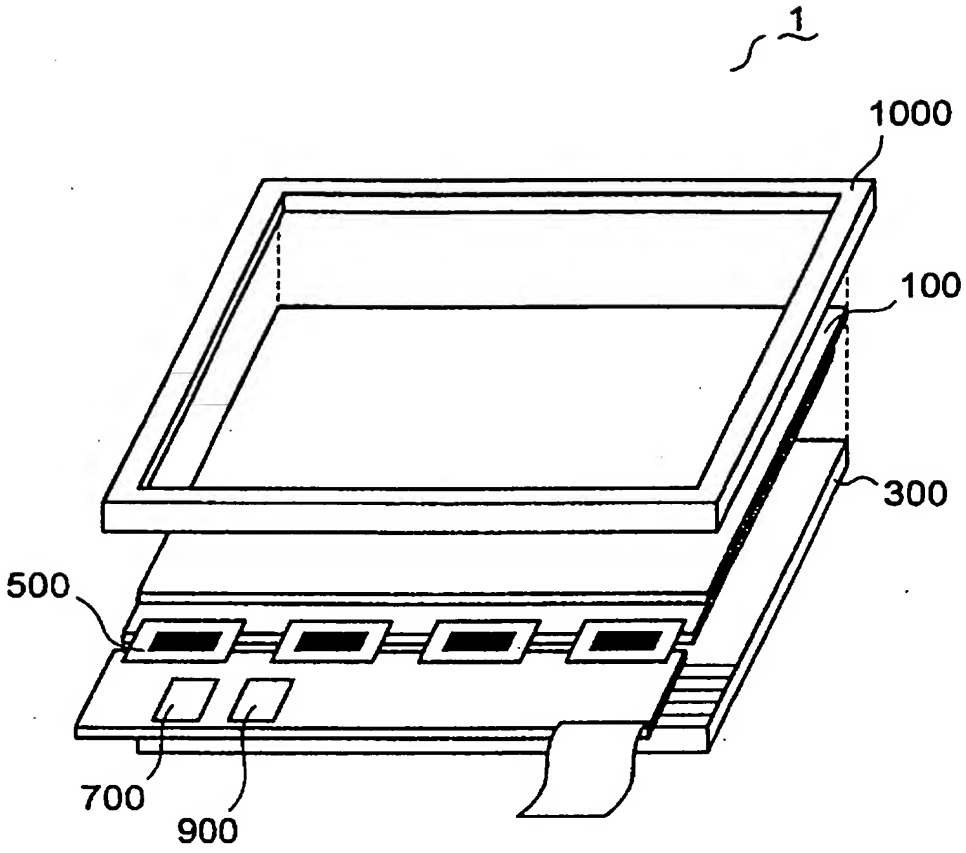

1
1000
100
300
500
700
900

FIG. 2

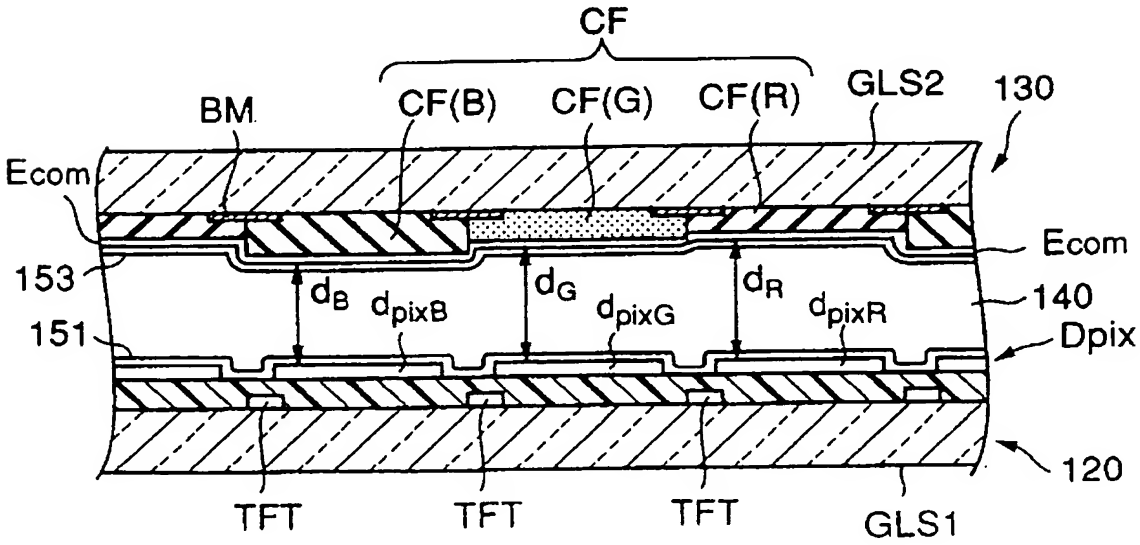

CF
CF(B)
CF(G)
CF(R)
GLS2
130
BM
Ecom
Ecom
153
151
d_B
d_{pixB}
d_G
d_{pixG}
d_R
d_{pixR}
140
Dpix
120
TFT
TFT
TFT
GLS1

FIG. 3

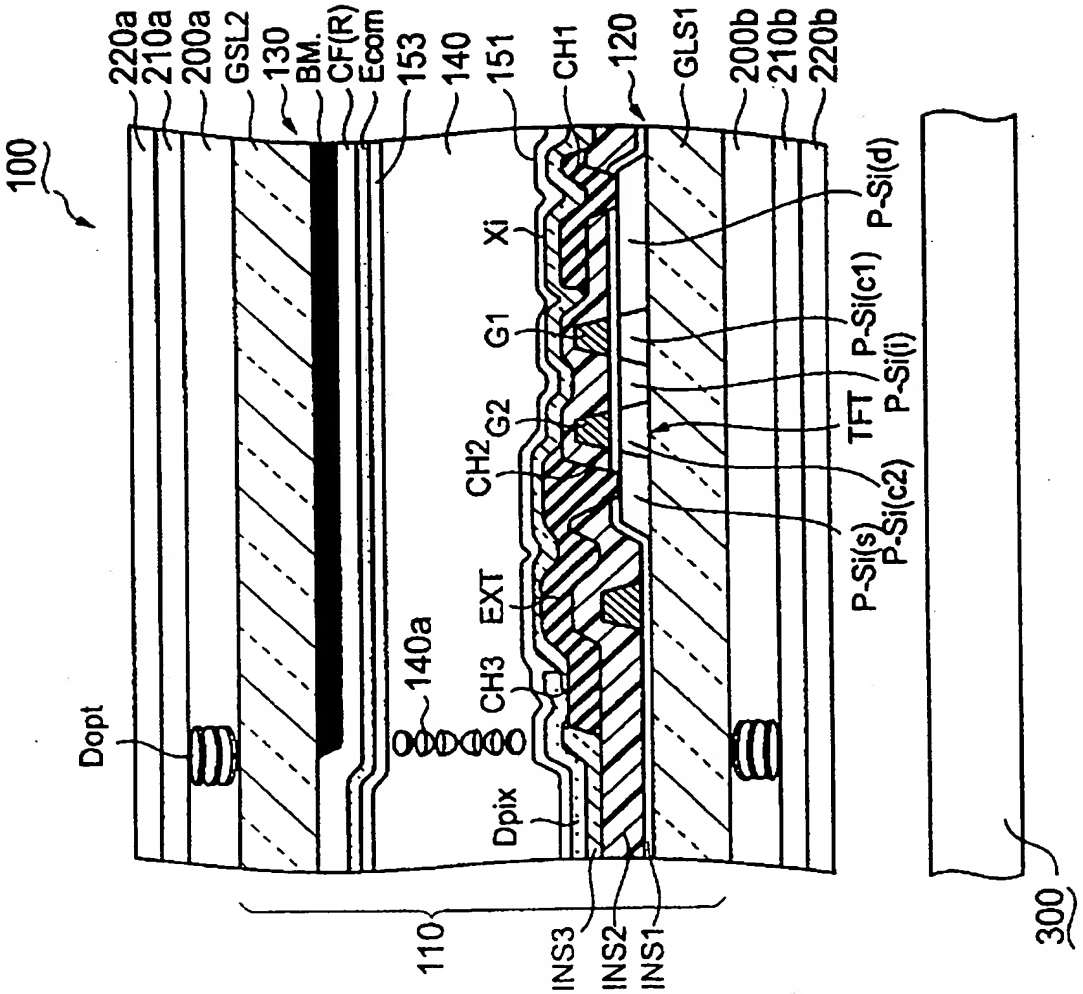

100
220a
210a
200a
GSL2
130
BM.
CF(R)
Ecom
153
140
151
CH1
120
GLS1
200b
210b
220b
Xi
G1
G2
CH2
EXT
CH3
140a
Dopt
Dpix
P-Si(d)
P-Si(c1)
P-Si(i)
TFT
P-Si(c2)
P-Si(s)
110
INS3
INS2
INS1
300

FIG. 4

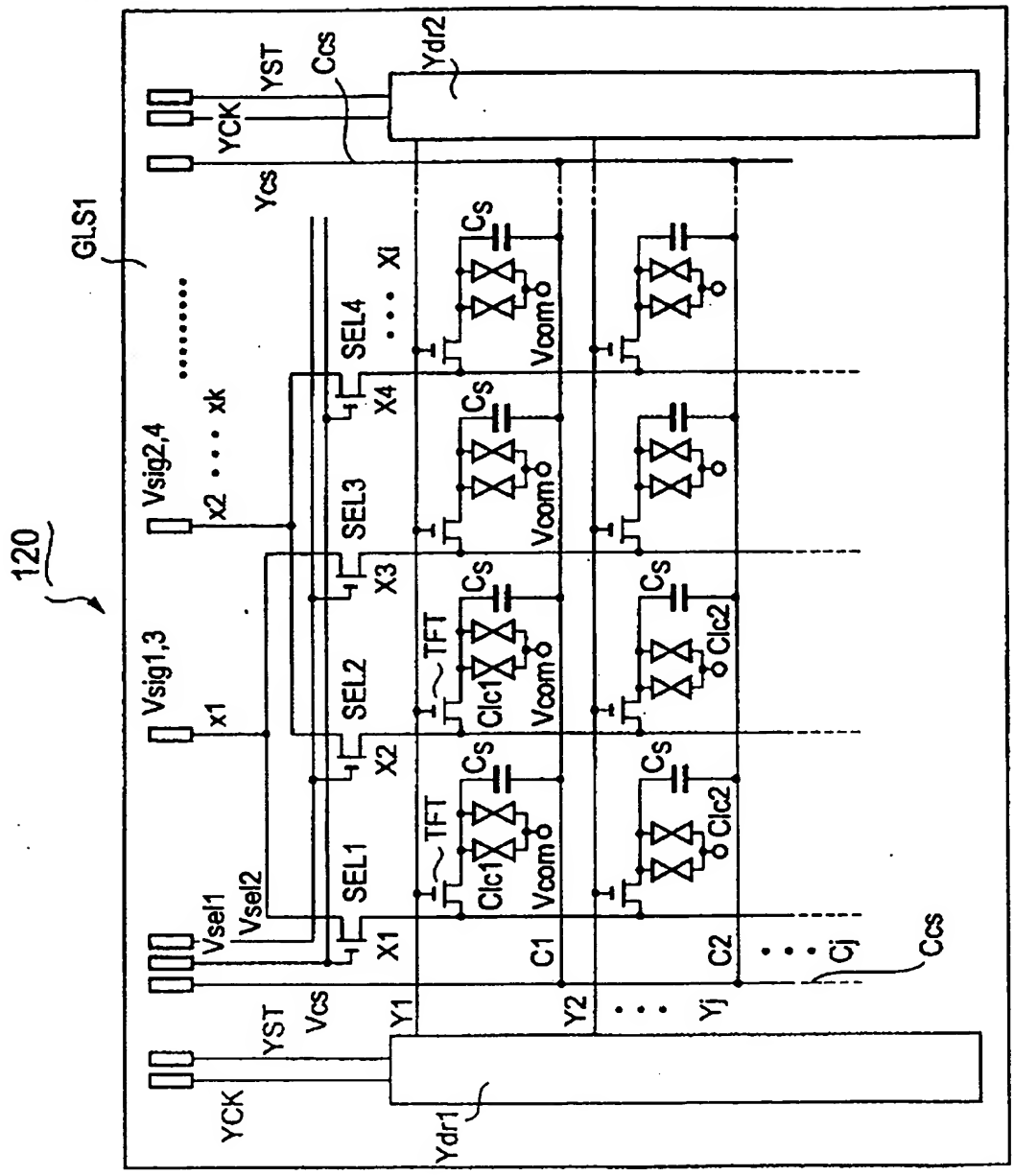

120
GLS1
Ydr2
YST
YCK
Ycs
Ccs
Vsig1,3
Vsig2,4
Vsel1
Vsel2
x1
x2
xk
Xi
X1
X2
X3
X4
SEL1
SEL2
SEL3
SEL4
TFT
Clc1
Clc2
Cs
Vcom
C1
C2
Cj
Y1
Y2
Yj
Vcs
Ydr1

FIG. 5

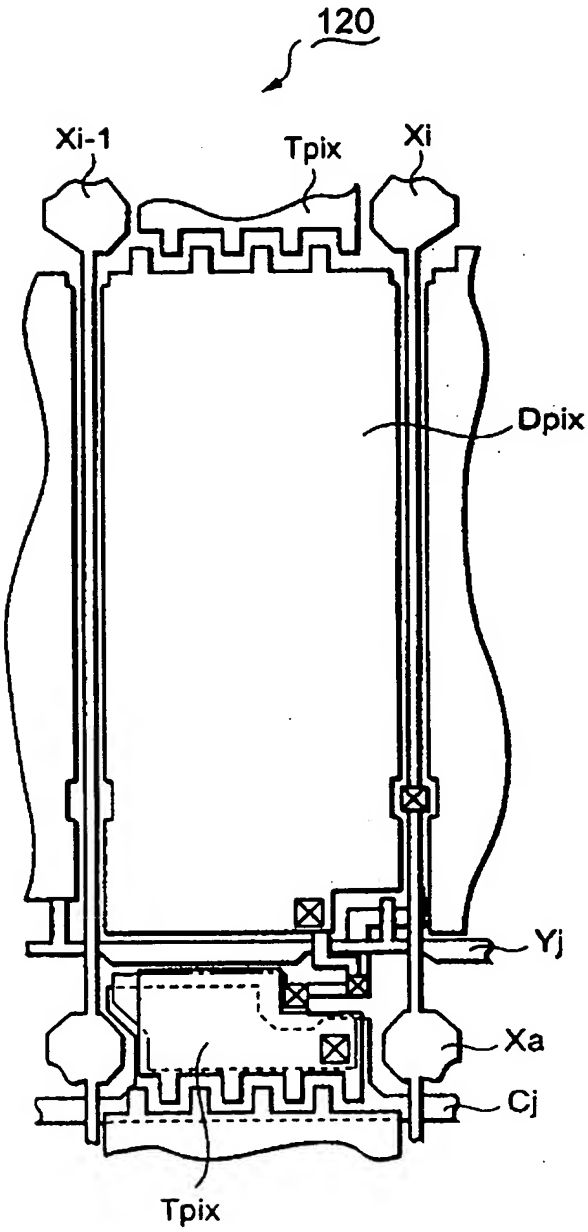


FIG. 6

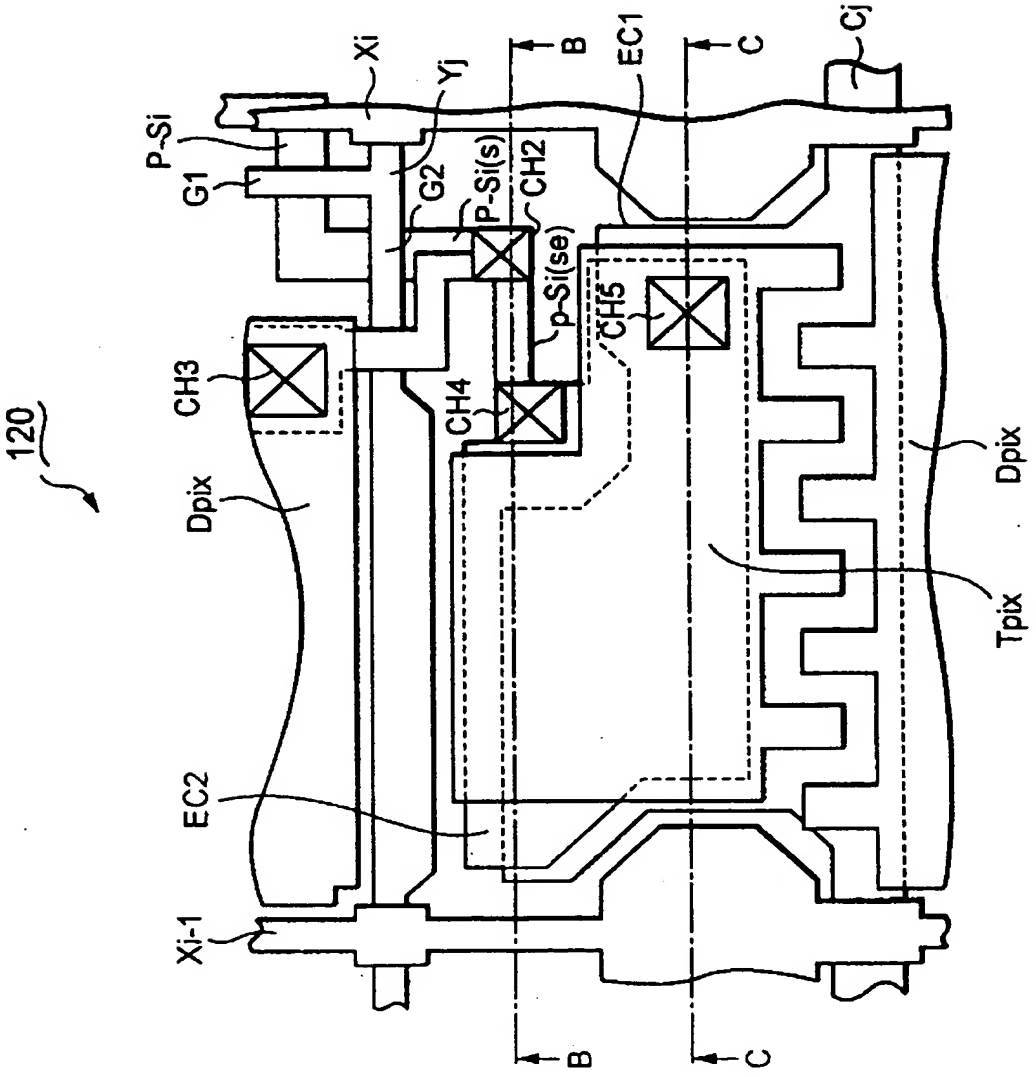

120
Xi
Yj
B
EC1
C
Cj
P-Si
G1
G2
P-Si(s)
CH2
p-Si(se)
CH5
CH3
CH4
Dpix
Dpix
Tpix
EC2
Xi-1
B
C

FIG. 7

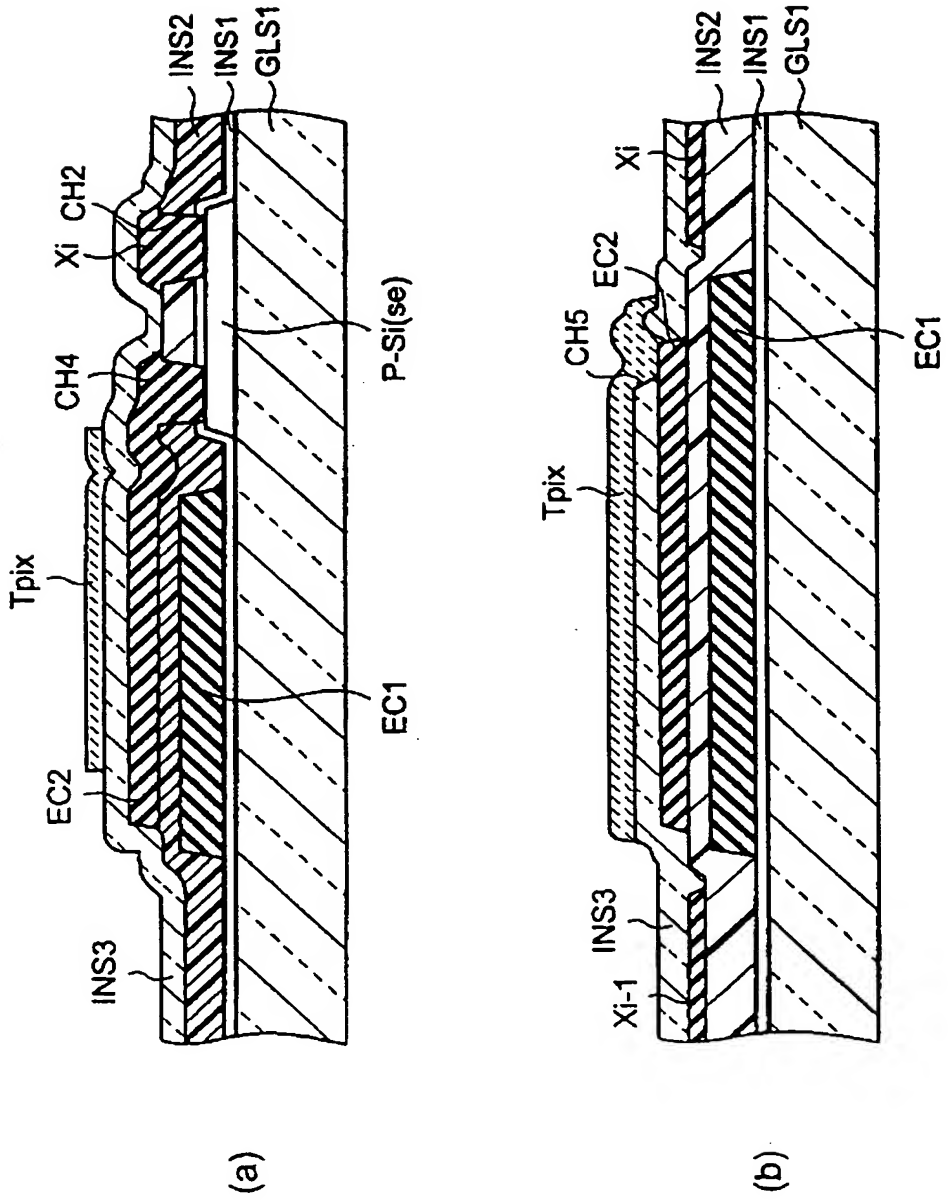
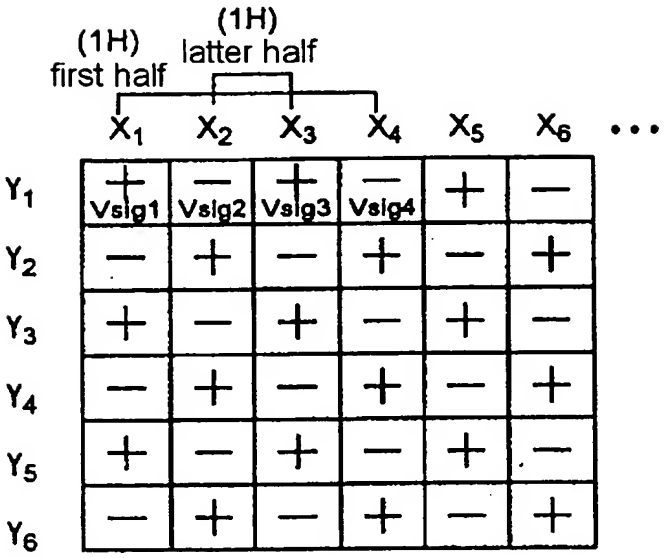

INS2
INS1
GLS1
CH2
Xi
P-Si(se)
CH4
Tpix
EC1
EC2
INS3
(a)
INS2
INS1
GLS1
Xi
EC2
CH5
EC1
Tpix
INS3
Xi-1
(b)

FIG. 8

(a)


(1H) first half
(1H) latter half
X1 X2 X3 X4 X5 X6 ...
Y1 Y2 Y3 Y4 Y5 Y6
Vsig1 Vsig2 Vsig3 Vsig4

(b)

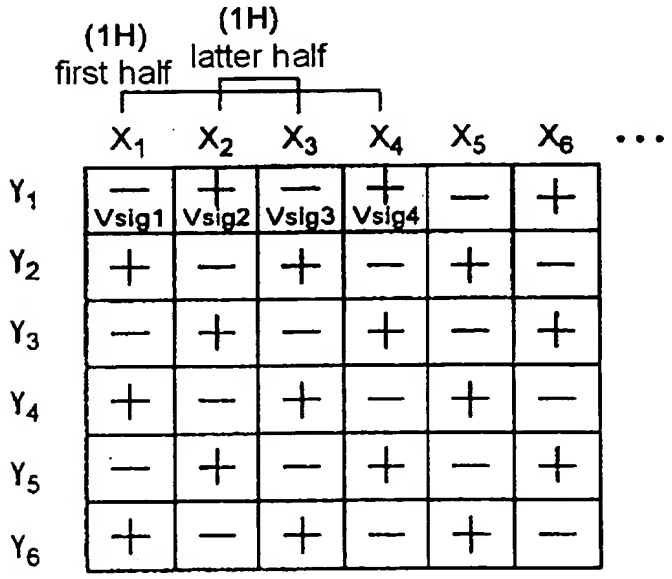

(1H) first half
(1H) latter half
X1 X2 X3 X4 X5 X6 ...
Y1 Y2 Y3 Y4 Y5 Y6
Vsig1 Vsig2 Vsig3 Vsig4

FIG. 9

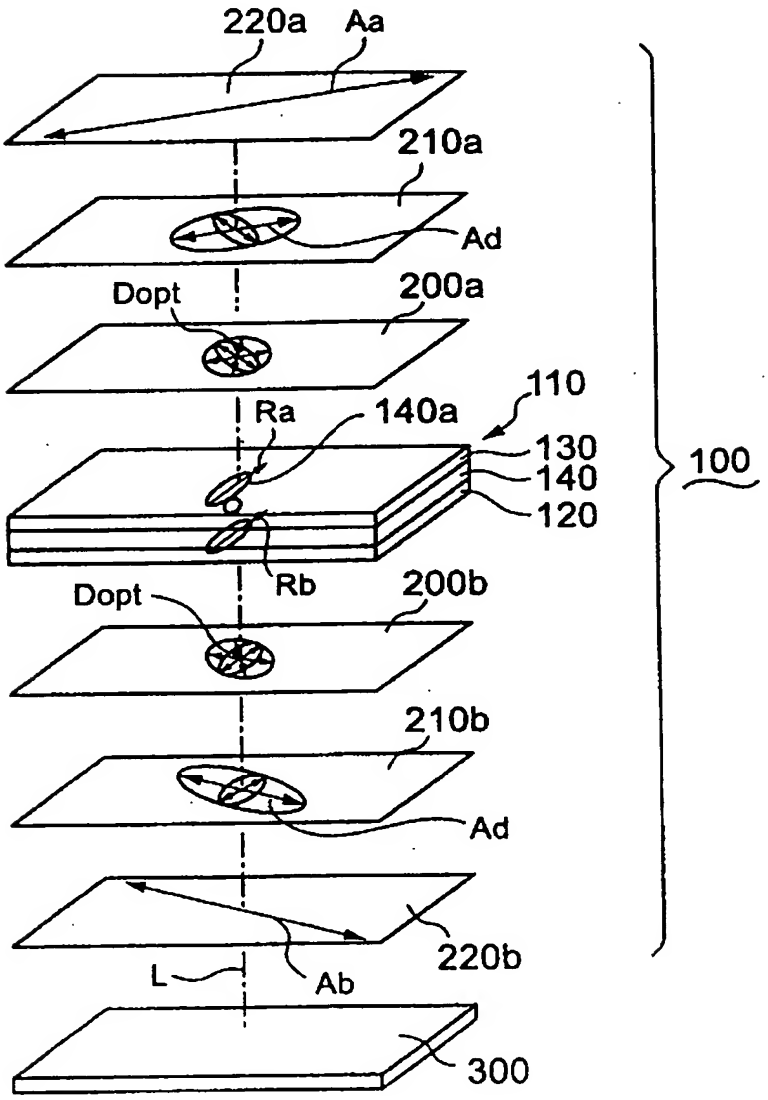

220a
Aa
210a
Ad
Dopt
200a
110
Ra
140a
130
140
120
100
Rb
Dopt
200b
210b
Ad
220b
L
Ab
300

FIG. 10

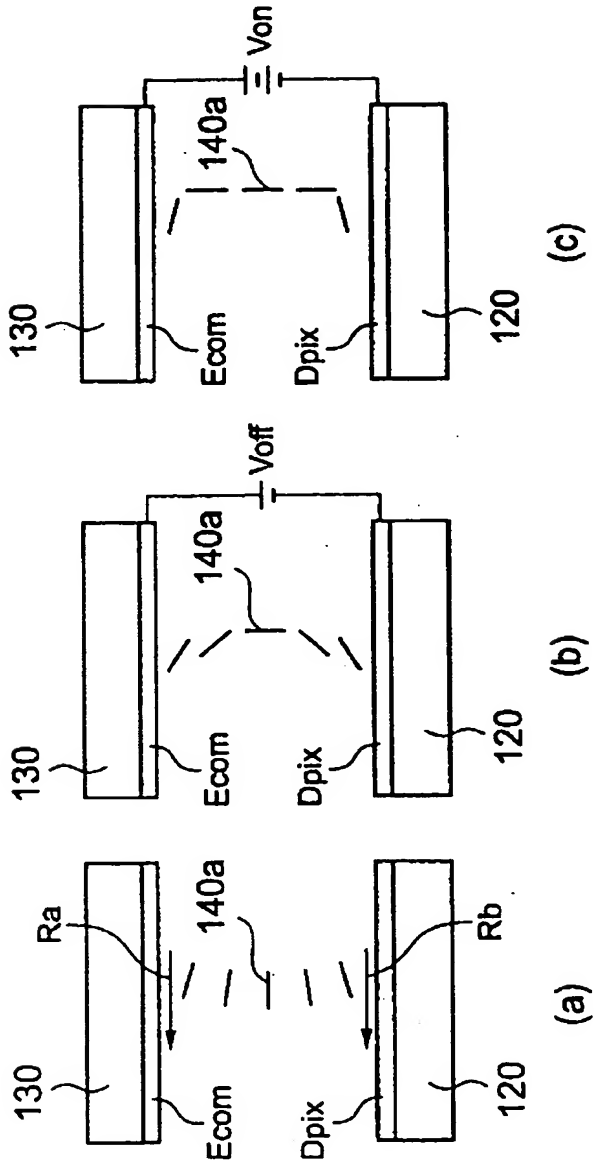

Von
140a
130
Ecom
Dpix
120
(c)
Voff
140a
130
Ecom
Dpix
120
(b)
Ra
140a
Rb
130
Ecom
Dpix
120
(a)

FIG. 11

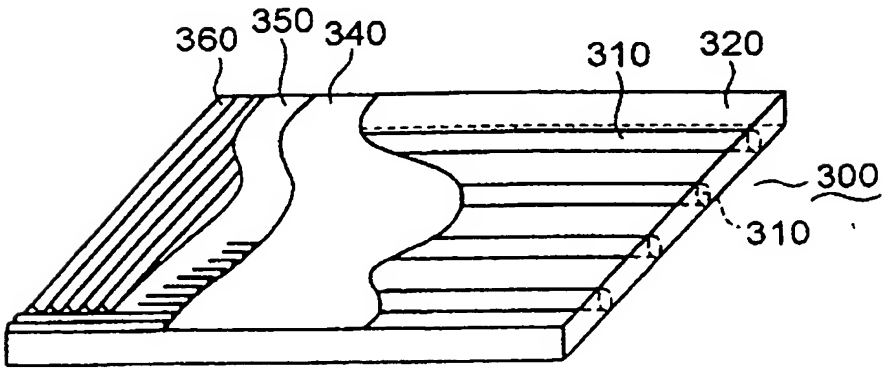

360
350
340
310
320
300
310

FIG. 12

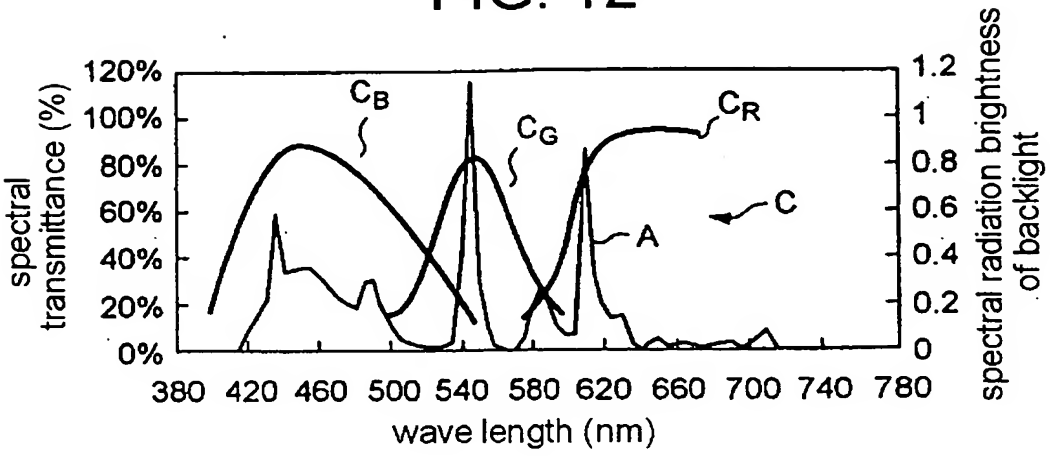


FIG. 13

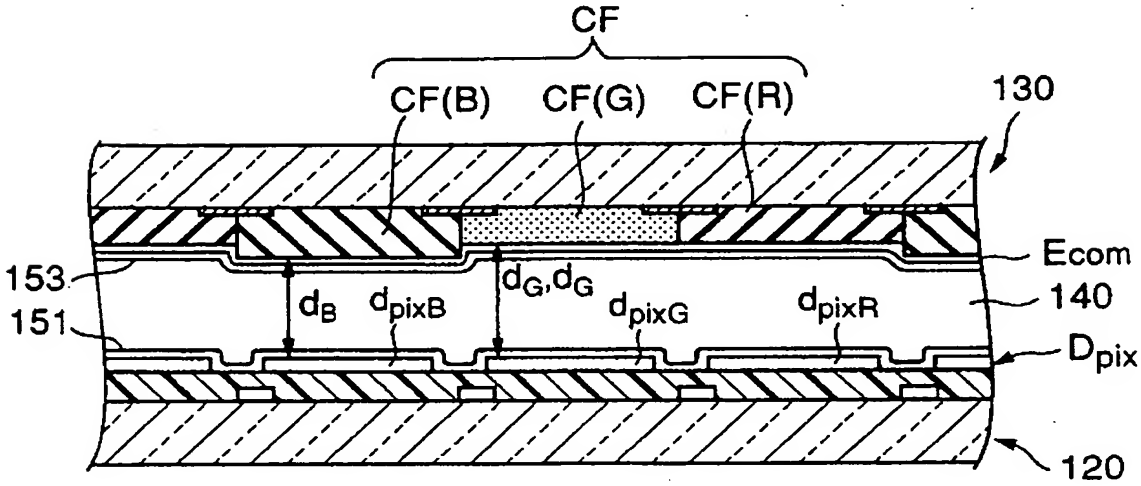


FIG. 14

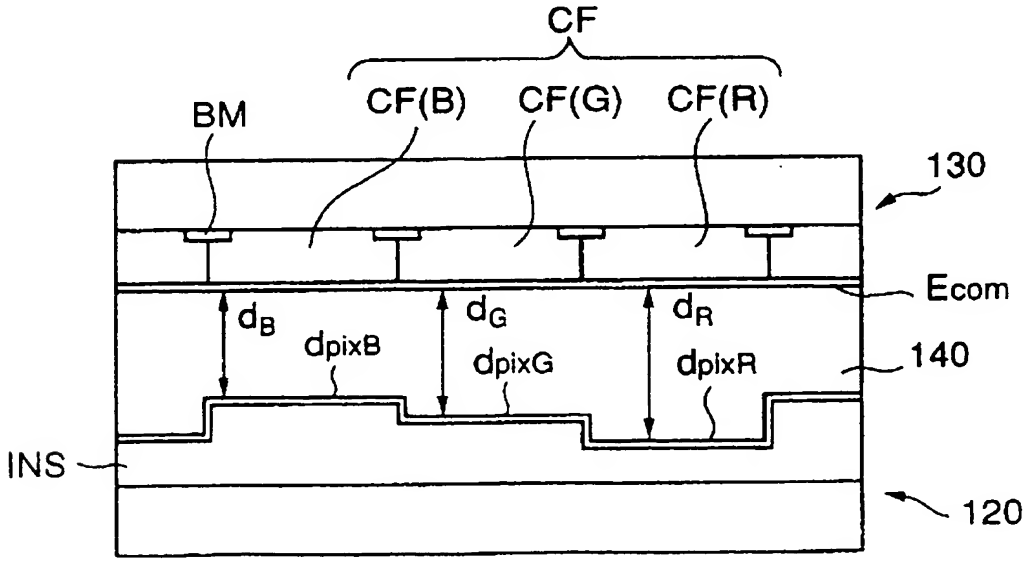


FIG. 15

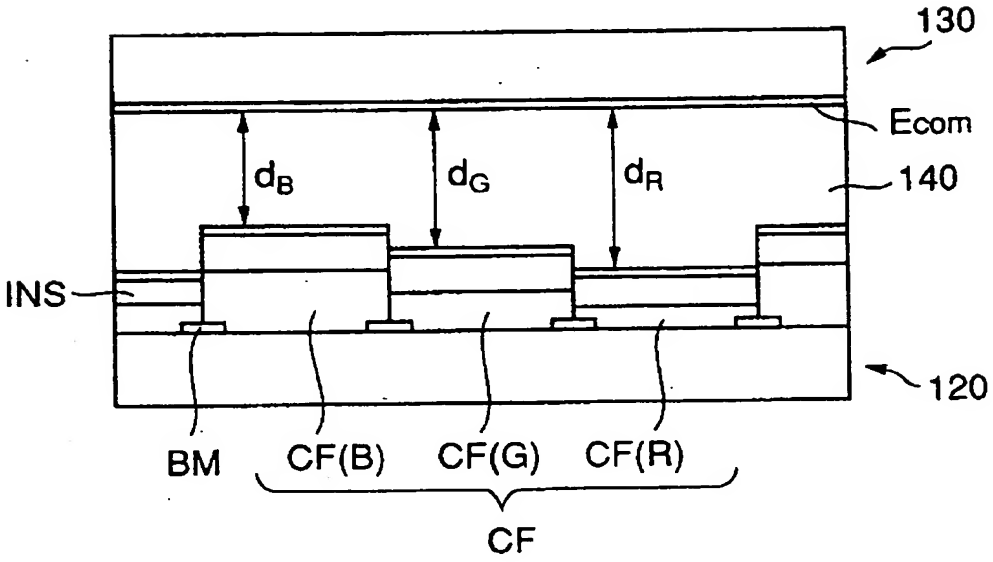

130
Ecom
140
d_B
d_G
d_R
INS
120
BM
CF(B)
CF(G)
CF(R)
CF

FIG. 16

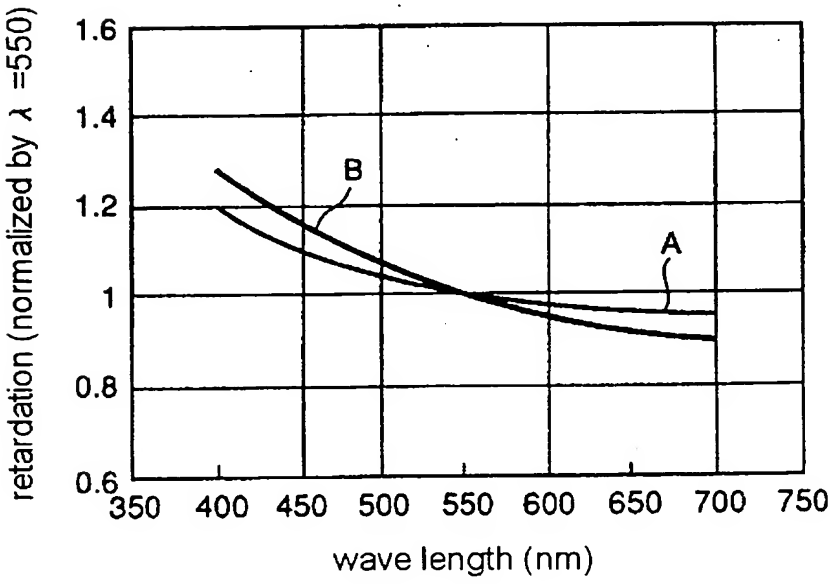

retardation (normalized by λ =550)
1.6
1.4
1.2
1
0.8
0.6
B
A
350
400
450
500
550
600
650
700
750
wave length (nm)

FIG. 17

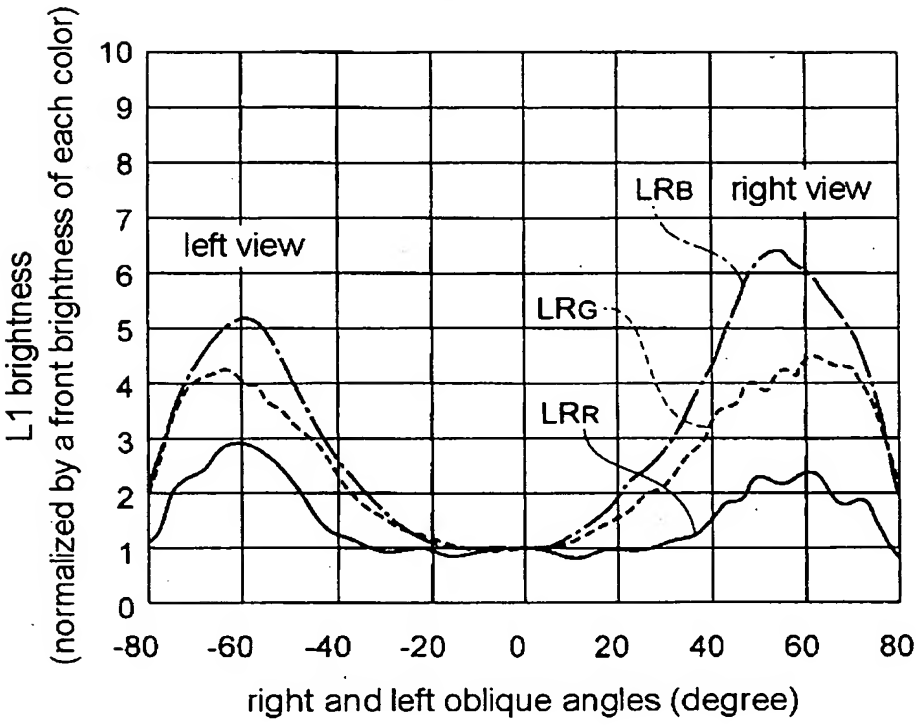

L1 brightness
(normalized by a front brightness of each color)
10
9
8
7
6
5
4
3
2
1
0
-80
-60
-40
-20
0
20
40
60
80
left view
LRB
right view
LRG
LRR
right and left oblique angles (degree)

FIG. 18

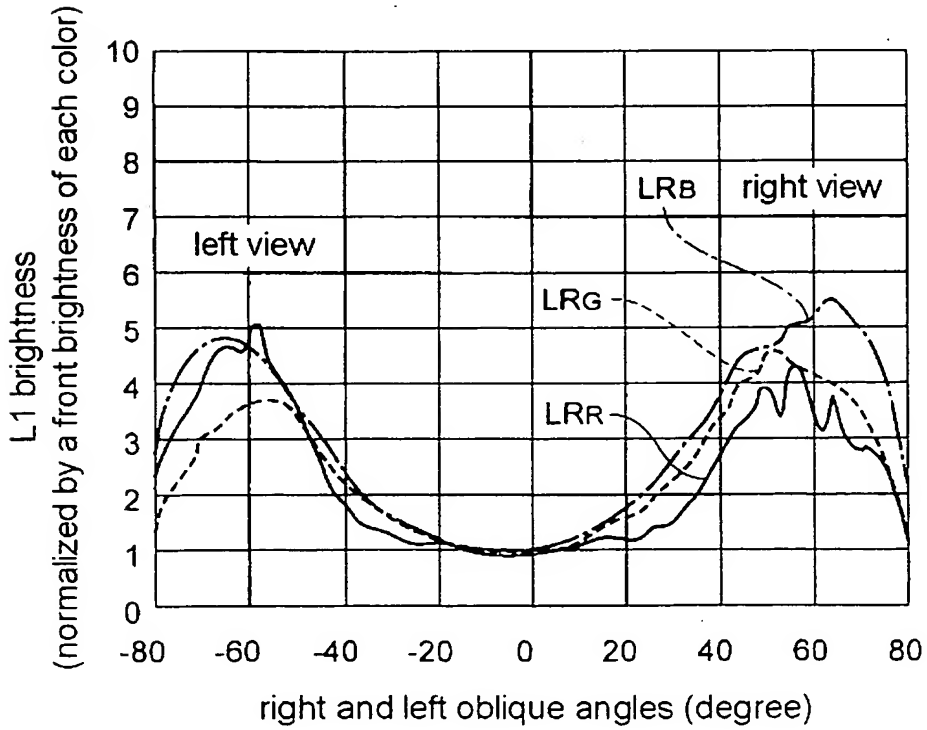

L1 brightness
(normalized by a front brightness of each color)
10
9
8
7
6
5
4
3
2
1
0
-80
-60
-40
-20
0
20
40
60
80
left view
LRB
right view
LRG
LRR
right and left oblique angles (degree)

FIG. 19

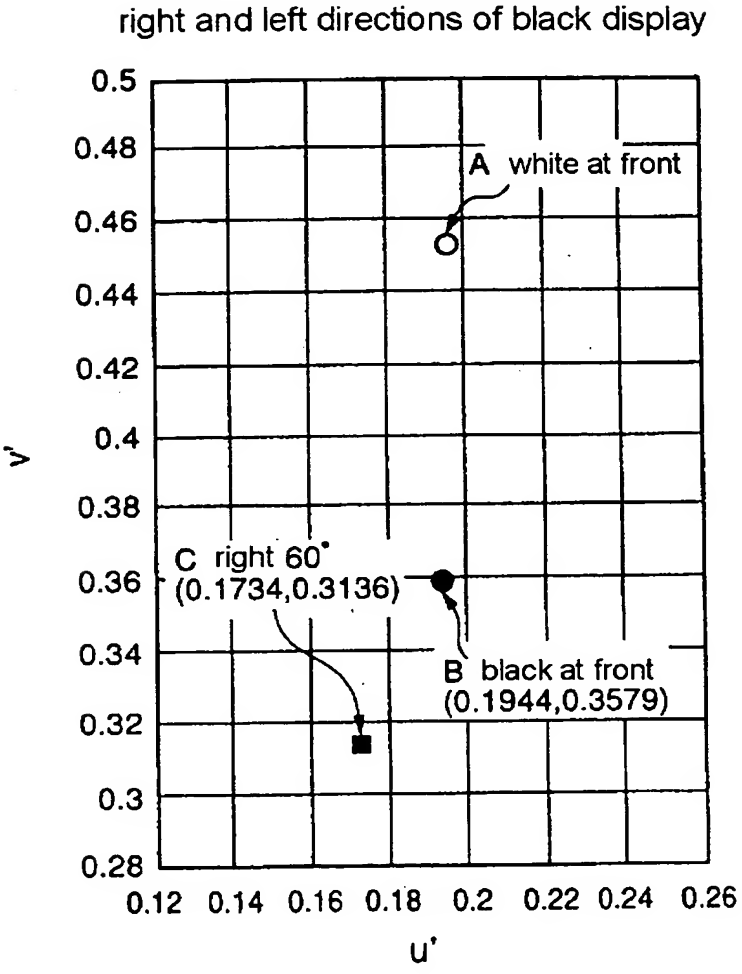
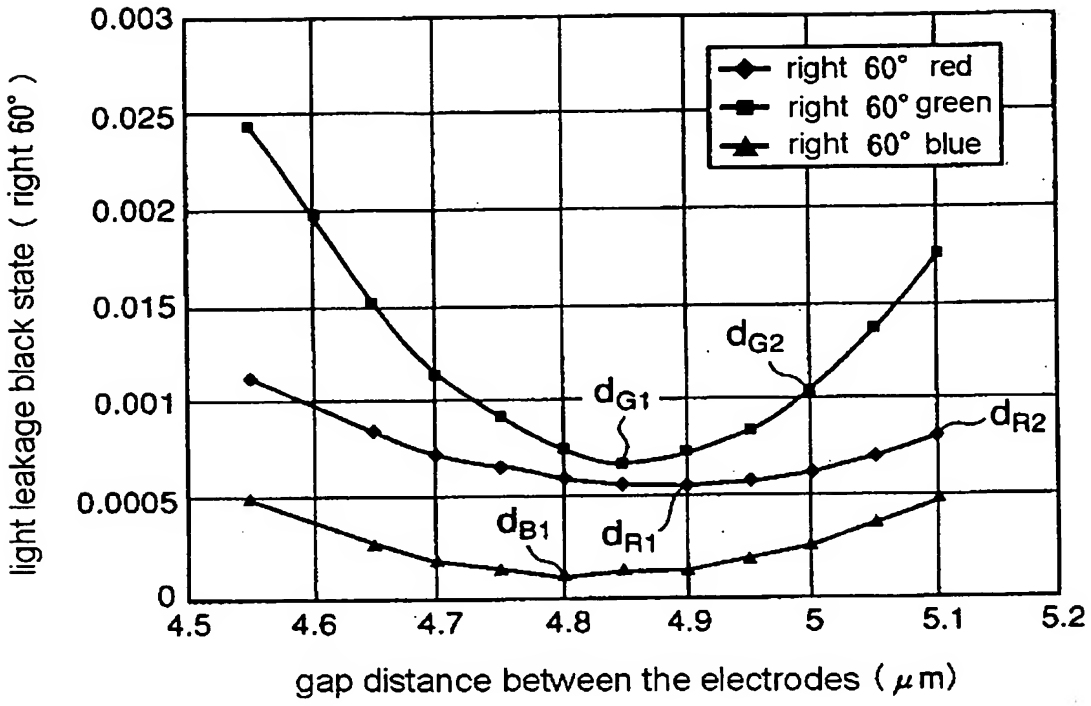

right and left directions of black display
0.5
0.48
0.46
0.44
0.42
0.4
0.38
0.36
0.34
0.32
0.3
0.28
v'
A white at front
C right 60°
(0.1734,0.3136)
B black at front
(0.1944,0.3579)
0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26
u'

FIG. 20


0.003
0.025
0.002
0.015
0.001
0.0005
0
4.5
4.6
4.7
4.8
4.9
5
5.1
5.2
light leakage black state (right 60°)
gap distance between the electrodes (μm)
right 60° red
right 60° green
right 60° blue
dG2
dG1
dR2
dB1
dR1

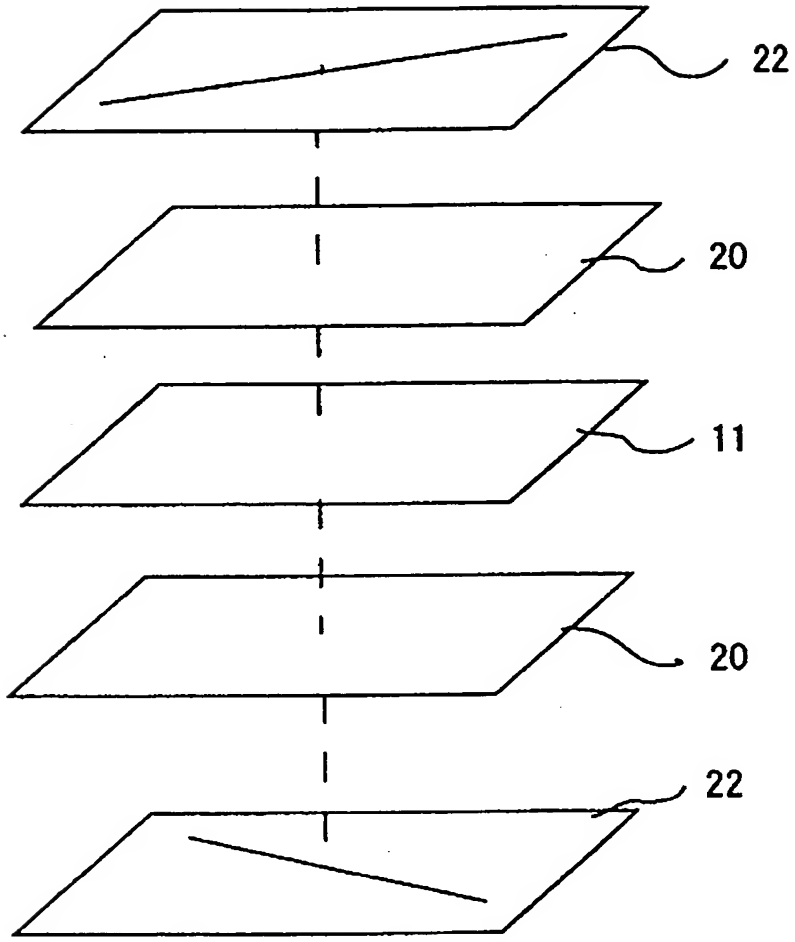



FIG. 21